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INFORMATION Sheet

Pre-Plant Renovation and Soil Conditioning For New Vineyard and Small Fruit Plantings

INTRODUCTION

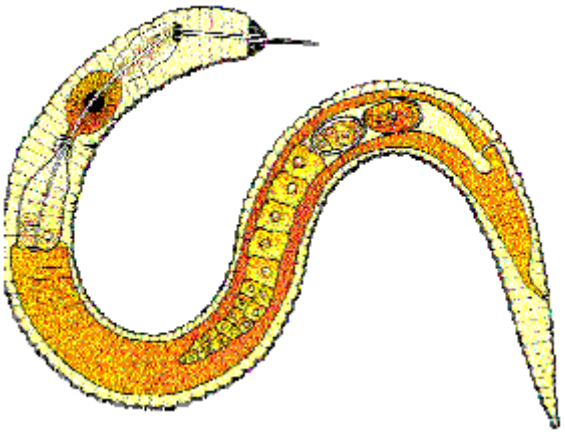
While many sites are planted to small fruit crops with little soil preparation beyond conventional lime and fertility adjustments and seem to do well for some years, others show signs of early plant decline or never seem to reach their full productive potential. This latter scenario doesn't only occur with old sites where fruit had been planted previously, but can develop even on sites that are left fallow for many years.

There are many factors that can lead to poor performance of new plantings including, presence of perennial weeds, allelepathic response to previous crop, residual herbicides, and improper-fertility and soil reaction. Two common reasons for poor site performance that are frequently overlooked are high populations of plant-parasitic nematodes and low organic matter.

PLANT-PARASITIC NEMATODES

Plant-parasitic nematodes are tiny, eel-like roundworms that feed in various ways on plant roots. The can cause continuous damage and reduce overall production, either directly or through induced disease.

The three species of nematodes that are commonly deleterious to small fruit plantings are: lesion (*Pratylenchus penetrans*), dagger (*Xiphinema americana*) and, root-knot nematodes (*Meloidogyne spp*.).



Lesion nematodes enter roots and travel longitudinally within them killing many cells and opening the roots to secondary invasion by a variety of root rotting fungi. Dagger nematodes feed from outside the root but can cause severe stunting of the root system since they feed just behind the growing tips. Dagger nematodes can also introduce tomato ringspot and similar viruses that also infect many small fruit crops. Root knot nematodes also feed from within the roots, but their feeding induces large gall-like deformities

that impair overall root function.

ORGANIC MATTER

Many of the upland agricultural soils in the Mid-Atlantic region contain only marginal amounts of organic matter (often less than 2 percent). Soils with a high organic matter content (3-4 percent or higher) are generally teeming with microbial organisms (bacteria, fungi, protozoa, nonparasitic nematodes) many of which are antagonistic to soil-borne plant pathogens through competition, antibiotic production, parasitism and predation.

SITE CONDITIONING PROGRAM

The pre-plant, soil conditioning program outlined here is based on research obtained from various sources throughout the Mid-Atlantic region. The program is aimed at improving native soil conditions and revitalizing old fruit crop sites by encouraging the establishment of a soil ecosystem that will support long-term productivity. This is done by incorporating large amounts of organic matter, adjusting the fertility and soil pH to near optimum conditions, and by reducing resident populations of soil-borne, plant-parasitic nematodes using green manure crops rather than chemical fumigants. Chemical soil fumigants can still be used for nematode control (methyl bromide, Vapam, Telone II, Telone C-l7), but we are unsure for how long, and none of these has any effect on organic matter content.

The “complete” program outlined here is for recommended soils having a history of or testing positive for specific plant parasitic nematodes and also low in organic matter. It is best when initiated 2 years prior to planting, and as vineyards and small fruit plantings are expensive to establish and long-lived. If the soil tests negative for nematodes or if the level of the organic matter is sufficient, the program can be amended to fit specific conditions. Timing of specific crops however is critical, as each has specific timing and temperature requirements for maximum effectiveness.

Two Years Before Planting

March to Early May

Remove all woody plants and their roots. Plow site thoroughly to expose additional woody roots and large rocks for removal. Collect and submit soil samples drawn from the top 12-16 inches of soil for pH and basic fertility determinations. Apply lime to adjust soil pH to 6.0 to 6.5 (higher levels can limit mineral availability). Incorporate these materials by deep plowing. [If more than 1,500 pounds of total oxides (lime) are required per acre, apply half before plowing and incorporate the other half by disking in after plowing.)

Mid-May

Broadcast 50 pounds of actual nitrogen per acre and the required amount of potassium and phosphorus needed for forage crops based on the soil test. Plant Sudex (sorghum x Sudan grass hybrid variety of Sorghum bicolor) at 20-25 pounds of seed per acre. Sudex is the crop of choice because it produces large amounts of biomass in a short time and its roots penetrate the soil deeply. It is also very good for both accenting the presence of and tolerating residual herbicides that may be present from the previous planting.

Mid-July to Late August

Mow Sudex using a rotary or flail mower just before seed heads mature. In late August, an additional mowing may be necessary with a flail mower to reduce the bulk of the plant residue before plowing it down thoroughly with a moldboard plow. An additional 30 pounds of actual nitrogen using *ammonium sulfate* should be applied after the first mowing to support the regrowth of the Sudex cover crop while providing some sulfur to support the subsequent rape crop.

Late August

Plant rape ('Dwarf Essex' var.; see below for sources) at 8 to 10 pounds of seed per acre. In addition to adding more organic matter to the soil, rape produces chemicals that are highly toxic toplant-parasitic nematodes. Two successive rape crops plowed under as green manure reduce nematode populations equivalent to that achieved with a Telone II chemical fumigation (Halbrendt).

Retest soil pH throughout the top 12-16 inches and add lime to adjust to pH 6.0 to 6.5 if needed. Add 15-20 pounds additional nitrogen per acre as ammonium sulfate to support rapid, early growth of rape crop.

***Note**: the sulfur in the ammonium sulfate may acidify the soil slightly at this level, but the added availability of sulfur contributes to the amount of toxicant produced within the rape plants.*

One Year Before Planting

Mid-April

Mow rape using a flail mower and plow down plant residue within 1-2 hrs. The toxicants within the plants are released with wounding and, thus, must be incorporated quickly to avoid loss to the atmosphere. Retest soil for basic fertility adjustment and then broadcast 50 pounds of actual nitrogen per acre (ammonium sulfate) and sufficient potassium and phosphorus needed to support forage crop growth. Two weeks after plowing, plant a second crop of 'Dwarf Essex' rape at the same rate noted above.

Mid-August

Mow and plow down the second rape crop as previously described. Make final adjustments in soil pH where necessary aiming for a pH of 6.0 to 6.5 except for blueberries where the field pH should be reduced to 5.0-5.5. Additional reductions in soil pH for blueberries will be needed the following spring, prior to planting.

Early September

Final treatments will depend upon which small fruit crops are to be planted.

Grapes, Brambles, Blueberries - Plant fescue ground cover. Endophyte-infested, Kentucky 31 tall fescue (30 pounds of seed per acre) will suppress nematode populations and exclude broad leaf weeds, but will require frequent mowing. Dwarf fescue grasses will reduce the need for mowing, but are less tolerant of heavy equipment travel and may or may not suppress nematode populations.

Plasticulture Strawberries - Prepare beds for planting two weeks after rape is plowed down. Change nitrogen source to calcium nitrate and incorporate with discing before bed preparation. Bed preparation follows current recommendations, including use of Vapam soil fumigant for weed seed control.

Matted Row Strawberries - Plant rye or barley as a winter cover crop unless soil fumigation is used to reduce weeds. If soil is to be fumigated, plant winter cover crop 1-2 weeks after treatment.

Year of Planting

April

Grapes and brambles - Two weeks before planting, apply Roundup™ herbicide in 3-4 foot wide strips where rows are to be planted. Leave the killed sod in place to reduce erosion.

Matted Row Strawberries - Plow down the winter cover crop and disc site thoroughly two weeks prior to planting.

Blueberries - The ideal blueberry soil is a light sandy loam with a pH of 4.3 to 4.8, with 4 to 6 percent organic matter. Use a two-bottom moldboard plow to open a 4-foot wide planting strip and incorporate additional organic matter such as composted sawdust and enough sulfur to adjust the pH. Two to three weeks after planting, when newly set plants show a flush of new growth, apply 10 pounds of actual nitrogen per acre using ammonium sulfate. Follow this with the application of 3-4 inches of mulch (composted sawdust, hardwood chips or bark) to help maintain soil moisture levels and to insulate roots from high summer temperatures.

SUMMARY

Pre-plant soil conditioning for perennial small fruit crops is the best insurance for efficient establishment, increased longevity, and continued high productivity. The program outlined here is intended to provide near ideal nutrient and soil pH conditions for growth throughout the entire rooting zone.

This process is aimed at reducing potentially damaging populations of plant-parasitic nematodes and increasing the total organic matter content to help stabilize basic nutrient requirements while encouraging overall biological activity in the soil.

References

Halbrendt, John. PSU Fruit Laboratory, Biglersville, PA

Steiner, Paul W. 1998. Pre-Plant Site Renovation and Soil Conditioning For Small Fruit Crops.

Resources

Sources of 'Dwarf Essex' var. rape: Hake Farm & Seed (PA) 717-244-2754; Ohio Seed Co., 800-879-3556

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Issued in furtherance of Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, University of Maryland, College Park, and local governments. Cheng-i Wei, Dean and Director of University of Maryland Extension.