The Benefits of Trunk Mounding in Honeycrisp Production

Planting Trees on a Mound/Ridge or Mounding Up Around a Tree

- Approaches have been used for years for different purposes and on different crops.
- Trees have traditionally been planted on Ridges or Raised Beds where soil is heavy or the water table is high.
- Trees have also been planted on berms (small ridges) to facilitate surface drainage and often to suppress crown rot.

Raised Beds
Raised Beds:
*Double top soil profile for the root system

Mounding / Planting on Berms or Ridges can alleviate Crown Rot issues.

- Surface run-off water away from plant crown.
- Speeds up drying and less potential for Phytophthora to develop.
Crown Rot
Peach Cherry

Common in California for stone fruit/nut crops. Berms are formed in advance; planted on them.

Almonds in Sacramento Valley, CA
Year One, Almonds

Year Two, Almonds, berms begin to erode and settle.
Year Four, Almonds

Y System Mature Peaches, Sacramento Valley, CA

Use of Berms or Mounding for Apple??

Growing Honecrisp in Northern Michigan attractive; excellent fruit quality and premium prices for fruit.
Dwarf Rootstocks Pose Issues

Increased precocity and reduction in vigor

Clonal Rootstocks Generate Burr Knots on Rootstock Shank

- What are they? "concentrated zone of preformed roots found in association with former leaf scars on shoots."
- Associated with ability to produce roots on stems in layer/stool beds.
- Most commonly occurs on all dwarfing rootstocks such as Malling series (9, 26), Bud.9, etc.
- Geneva Series: Propensity to Burr Knot either reduced or not known.

Rootstock layers are shoots which generate roots when exposed to soil

Stool- Bed Nursery
When Exposed to Soil, Roots Are Generated on Stem Tissue

• Must avoid scion rooting by making sure union is sufficiently high at planting.
• Roots begin as ephemeral, but if allowed to develop after several years, dominate impact of dwarfing roots.

Scion rooting needs to be avoided

• Trees established with unions less than 3 inches in height above soil level are subject to settling and eventual scion rooting. Scion rooted trees become vigorous.
• To avoid scion rooting, plant so that the union is at least 4-6 inches above soil level.

2 X 6" board as reference

25 yr old Mac/M.26
Dogwood Borer Attacks Apples on Dwarfing Rootstocks

- Burrknots are entry sites/carbon source for Dogwood Borer Synanthedon scitula (Harris).
- DWB larvae feed on roots then bark. Reduces tree vigor / girdles and death.
- 50% of trees on dwarfing rootstocks will be infested with DWB in New York (Kain and Agnello, 2010) and Michigan.

Dogwood Borer

- Control Measures:
  1. Trunk spray with chlorpyrifos (Lorsban) (high-pressure hand-gun)
  2. Antagonistic sex pheromone (pheromone confusion; Isomate-LPTB dispensers) (Kain and Agnello, 2010)
Chemical Control

• Trunk applications of Lorsban 75WG at 2.0 pounds per 100 gallons or Lorsban 4E and Lorsban Advanced at 1.5 quarts are effective when applied as trunk spray < 4 ft away.
• **Thorough coverage** of burr knots and surrounding areas of the lower trunk late June to mid July.
• Only one application of chlorpyrifos is allowed per growing season. Do not contact foliage or fruit.
• Assail is also allowed and labeled.

Mounding

• "76%-99% reductions in a heavy pressure situation which was determined to be comparable or more effective & safer than those reported for trunk sprays of chlorpyrifos." (Gut, McGhee and Perry, 2005).
• Rootstock shank covered with soil, adventitious roots extend in soil = burr knots don't develop. (Lyons, et.al., 1983 and Rom, 1970).
• Least expensive among control measures. Berm constructed in Year 1, little to no maintenance afterwards.
  • Maintenance in Year 3…. If berm has not settled to below union, must remove.
  • Cut off woody roots if established.

Forming Berms/Mounds

• Initially, mound soil to 3 inches or more above the union.
• Yr 2&3 mound erodes to below union. If not, pull soil away.
• Small scion roots (<¼” to 3/8”) can be exposed or cut.
• Adventitious rootstock shank-roots, develop bark; resemble shoot bark; a cork exterior no different that shoots before extending into the soil.
• Depending on the rootstock, this can be a source for some suckering.
• Scion roots greater than ½” diameter if allowed to remain may negate dwarfing rootstock influence, especially after the fifth growing season.
Using a Grape hoe to form berm; 2 passes

Roots from Burr Knots

Young roots exposed to air perish

Rootstock-shank roots; extended into mound after soil erodes @ ~ 4th year.
Can planting trees on mounds thwart Armillaria

- Planting peaches on ridges suppresses and avoids Armillaria mellea?
- [http://www.goodfruit.com/Good-Fruit-Grower/July-2011/Peaches-on-ridges/](http://www.goodfruit.com/Good-Fruit-Grower/July-2011/Peaches-on-ridges/)
- Slows down Armillaria root rot, growers are already trying it in their orchards.
- Peach trees planted on ridges, then pull back the soil a couple of years after establishment, exposing the tops of the roots. Armillaria cannot reach the crown to kill the tree. “The fungus does not like to grow above the soil line—that’s the key,” Dr. Guido Schnabel, Plant Pathologist, Clemson.

Honeycrisp is a weak growing variety, especially on dwarfing rootstocks & on coarse soils

- Particularly a problem in Northern Michigan.
- Also a problem on gravelly soils of Mid-Michigan.
- Avoid use of B.9 and M.9 rootstocks.
- Many trees will runt and stunt on these stocks and sites.....= 6-7 ft canopy.
- Reduced canopy volume = yield↓ per acre.
Wittenbach Rootstock Trial
Belding, MI, Aug 2006

Background trees
All on M.9 RN 29

Foreground trees
on Cornell Geneva Elite rootstocks

Trial established by R. Perry
now data reported by G. Lang

Planting Height has an impact on Canopy Vigor

- Well known among apple growers in Europe, but often not seen in publications.
- “The higher the bud union is above the ground, the more dwarfing effect there is on the tree” (from “Adapting high density systems to your needs”, - growers panel, pg 171. In, Intensive Orcharding, managing your high production apple planting. Pub, Good Fruit Grower, 1989 Pub 187 pp.
- Perry’s Rule of thumb... for every inch the union is above ground on M.9 = 6 - 12 inches in canopy reduction profile dimension.
Slender Spindle multi-row bed system; ~ Belgium 1985

- note union height ~ 12” above ground
- Important in managing ultra HD systems

Tall Spindle Orchard
South Tirole, Italy

- Union height = 6 inches + above ground

LOW Union Blondee / M.9
HIGH Union Blondee / M.9
High Union Blondee / M.9

Low Union Blondee / M.9

Wittenbach Rootstock Trial
Summer 2005

USDA Rootstock Breeder,
Dr. Fazzio

Ed W. Mike W.

14 stocks under test at Belding &
19 stocks under test at NWMHRC

Aug 2006
Mounding effects on vigor

Images Dec 2011

- Mounding may enhance canopy vigor.
- Needs validation....
- Critical to Honeycrisp
- Shanks with roots more vigorous than no roots ??

Same Rootstock Side by Side

- Is Union Height and the amount of rootstock-shank exposed influential on canopy vigor
- OR
- Is it a matter of where the roots are initiated on the rootstock shank with respect to the union

Remnants of mounds

Image May 2005
Summary Benefits

1. Facilitate surface drain away from tree and avoidance of Crown Rot

2. Plant shallow and avoid potential of scion rooting.

3. More exposure of the rootstock shank to air, encourages Burr Knots on dwarfing clonal rootstocks (B.9, M.9, M.26, etc.).
   - Burr Knots deform trunks.
   - Burr Knots carbon source for insects… Dogwood Borer and Wooly Apple Aphids.

4. Root primordia in BK extend into soil and BK no longer a factor.

5. Least costly and most sustainable approach to avoiding DWB.

6. Mound/Berm can protect and insulate rootstock-union/shank in first winter.

7. Will encourage extension of adventitious root initials which may enhance canopy vigor.

References:

References:  