

The Benefits of Trunk Mounding in Honeycrisp Production



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

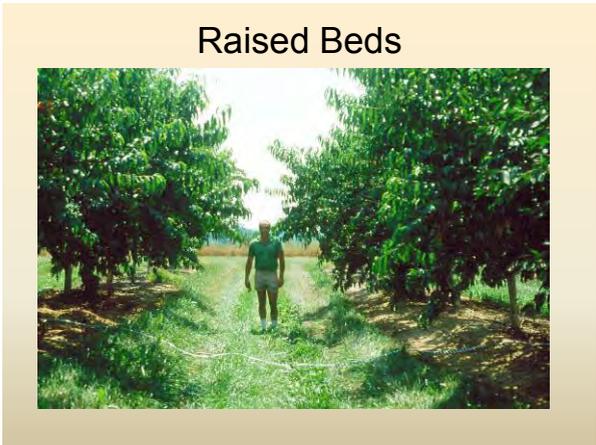
- Approaches have been used for years for different purposes and on different crops.
- Trees have traditionally been planted on Ridges or Raised Beds where soil is heavy or the water table is high.
- Trees have also been planted on berms (small ridges) to facilitate surface drainage and often to suppress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

Raised Beds





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



Raised Beds

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.

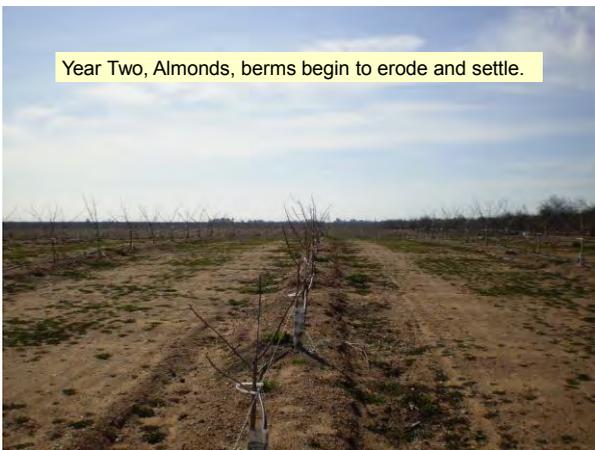


**Almonds in Sacramento
Valley, CA**













Use of Berms or Mounding for Apple??



Growing Honeycrisp 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.



Stool- Bed Nursery



Rootstock layers are shoots which generate roots when exposed to soil



Seen in the first couple years on exposed rootstock shanks

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



M,9 root system marginalized

- 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.



Scion rooted High Union 25 yr old Mac/M.26

- To avoid scion rooting, plant so that the union is at least **4-6 inches** above soil



2 X 6 " board as reference

Scion Rooted; Golden Delicious / 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)
- 3. "Soil Mounding as a Control for Dogwood Borer in Apple". 2005. HortScience 40(7):2066-2070) by Gut, McGhee and Perry

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.
- *Wise, J. 2011. Michigan fruit management guide 2011. Extn Bull E-154.*

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 (<1/4" 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 1/2" 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



Mounding with shovel, Fall 2011





Roots from Burr Knots



Young roots exposed to air perish



Rootstock-shank roots; extended into mound after soil erodes @ ~ 4th year.

Rootstock-shank roots generated in mounding; trees 9 years old

Gala / Bud.9E



B.9 Suckers

Gingergold / Bud.9

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/>
- 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.

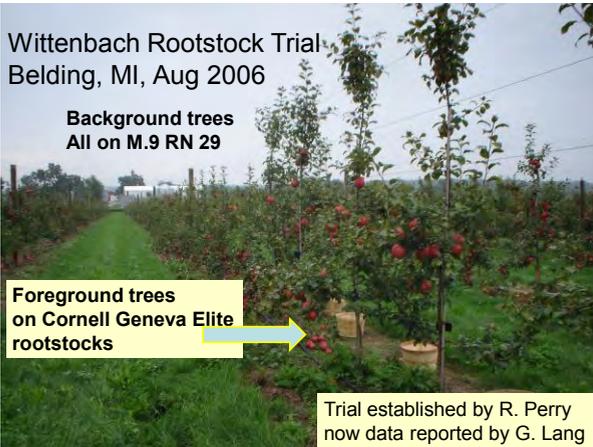
M.26-M.7 size stocks for N. Michigan
Review 2004 HC Trial of Geneva Elite Rootstock
Dr. G. Lang



Size 1	Size 3	Size 5	Size 7	Size 9
M.27	M.9	G.30	MM.106	P.18
P.22	P.2	G.935	CG.7707	
G.65	G.41	CG.5087		
	G.16	CG.5179		
		CG.5757		
Size 2	Size 4	Size 6	Size 8	Size 10
B.9	M.26	M.7	MM.111	Sdng
Mark	G.11	CG.6210	CG.8534	
P.16	G.202			
	CG.4013			
	CG.4213			

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

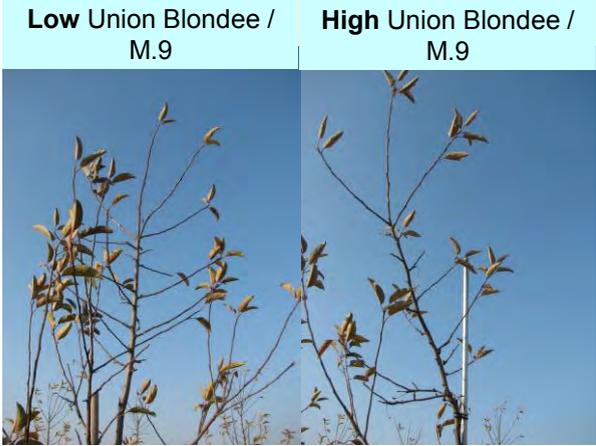
Planting Height has an impact on Canopy Vigor

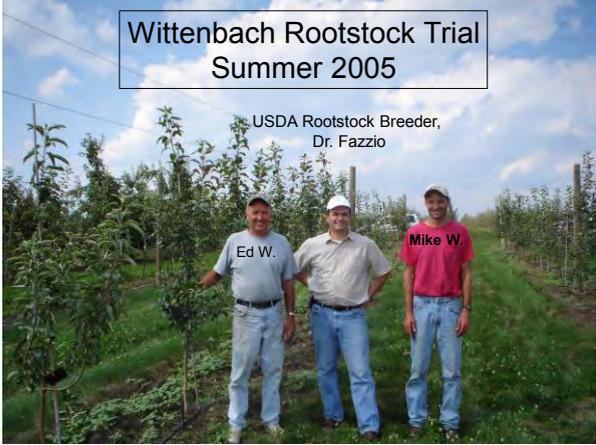
- Well known among apple growers in Europe, but often not seen in publications.
- **“The higher the bud union is above the ground, the more dwarfing effect there is on the tree”**
 (from “Adapting high density systems to your needs”, - growers panel, pg 171. In, Intensive Orchardling, managing your high 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.**



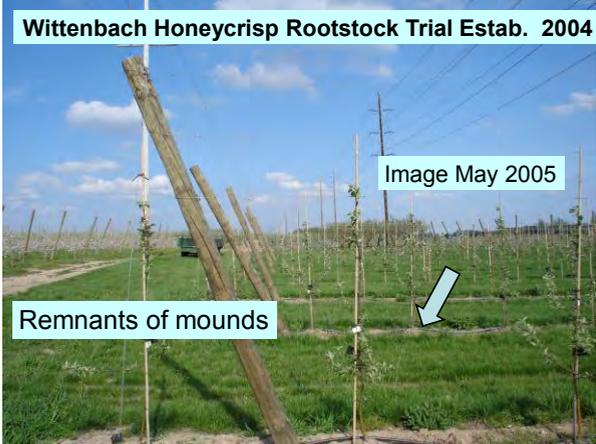


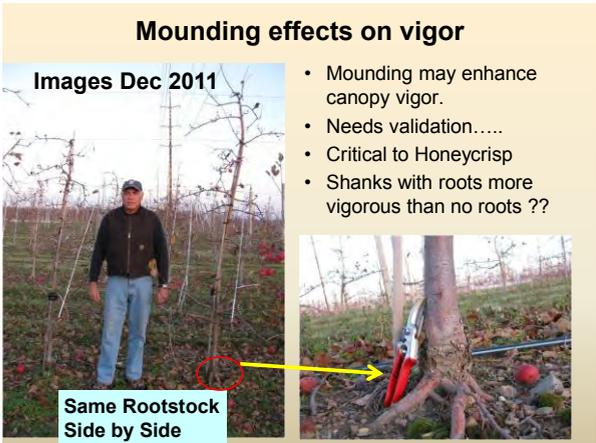


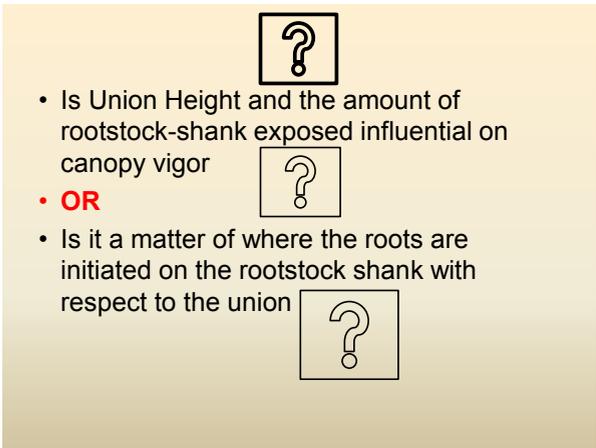












Summary Benefits

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 Woolly Apple Aphids.

Summary Benefits

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:

Dave Kain and Art Agnello, NY Fruit Quarterly, Fall 2010, 18(3): 23-24.
Ferree and Carlson. 1987. In, Rootstocks for Fruit Crops, Wiley, NY.
Gut, L.J., P.H. McGhee and R. Perry. 2005. HortScience 40(7):2066-2070.
Lyons, C., R.Byers and K. Yoder. 1983. HortScience 18:923-924.
Marini,R, et.al. 2000. J. Amer.Pomol.Soc.54:92-107.
Perry, R. 2000. CAT Alert 15(1):2-4.
