WALNUT HEDGEROW PLANTING ON MARGINAL SOILS

John Edstrom, Bill Krueger, Wilbur Reil

ABSTRACT

This report summarizes 1995 results from the Nickels Soil Lab walnut hedgerow trial on marginal soil. The performance of two varieties (Chandler and Howard) and two rootstocks (Paradox and Northern California Black) are being compared on slip plowed and unmodified soil. Rootstock continues to have the greatest impact on yield with both varieties (Chandler and Howard) and under both slip plowed and unmodified soil conditions. Average yield for 1995 for both varieties on both soil conditions was 5766 lbs./Ac. for Paradox rooted trees versus 3933 lbs./Ac. for NC Black rooted trees.

In contrast to past yield data, 1995 Chandler production (5214 lbs./Ac.) exceeded that of Howard (4485 lbs./Ac.). No advantages to date has been shown for the slip plow soil treatment versus unmodified soils. Kernel quality from this trial compares favorably with like varieties in major growing districts. Chandlers yielded 75% in large sizes (down from 90% in past years), 47% edible and 90%+ in the extra light or light categories for color. Howard showed 73% in the large size group, 45% edible and also 90%+ in extra light and light categories.

OBJECTIVES

1) Investigate the feasibility of producing English walnuts on marginal soils using a hedgerow planting system and low volume irrigation.

2) Assess the effect of soil modification (slip plowing) on tree growth and performance under the soil conditions found at the Nickels Soil Laboratory.

3) Compare the performance of Northern California Black and Paradox rootstocks on soils of the type found at the Nickels Soil Laboratory.

4) Test the adaptability of two relatively new walnut cultivars, Chandler and Howard, to the hedgerow system.

PROCEDURE

The trees were planted during the spring of 1986 at the Nickels Soil Laboratory in Arbuckle. The planting configuration was a dense hedgerow, 12 ft. between trees in the row and 18 ft. between the rows, giving 202 trees per acre with a north-south row orientation. Prior to planting, half of the plot was slip plowed to a depth of 6 ft. on 10 ft. centers north and south. Six replications of four treatments were planted in a randomized complete block design in both the slip plowed and non-slip plowed sections. The eight combinations being evaluated are:
1. Howard-Paradox  Slip Plow
2. Howard-Paradox  Non Slip Plow
3. Howard-NC Black  Slip Plow
4. Howard-NC Black  Non Slip Plow
5. Chandler-Paradox  Slip Plow
6. Chandler-Paradox  Non Slip Plow
7. Chandler-NC Black  Slip Plow
8. Chandler-NC Black  Non Slip Plow

Trees grafted to Howard on Paradox were unavailable at planting time, so, Paradox seedlings were planted and then grafted to Howard in 1987. Cisco and Franquette were planted around the outside of the plot to insure adequate pollination (12% pollinizers).

The trees are drip irrigated, using ET° calculations based on data from the nearby CIMIS weather station, and received monthly N applications via drip lines. Initially the trees were irrigated with a single drip line per row. In response to unacceptable vigor in 1990, a second drip hose was added, which approximately doubled the wetted soil area in 1991. Since this change, shoot growth has been acceptable for a developing walnut orchard. Potassium sulfate was applied at 1 lb./emitter (600 lbs./acre), October 1994 in response to lowered leaf potassium levels found in July leaf samples.

The trees were trained and pruned to develop a fruiting wall. Both the east and west sides of the hedgerows were mechanically hedged and the trees topped yearly through March of 1992. In March 1993, yearly alternate side mechanical hedging began by pruning one side of the hedgerow 4 feet from the trunk of the trees. Moderate mechanical topping has been performed yearly as needed to stimulate top growth to the desired tree height of 16 feet. However, for 1995 topping was performed only on short statured trees (mainly plots with NC Black). Thus, the more vigorous treatments which had achieved the desired height of 16 feet were left unheaded for the 1995 growing season.

RESULTS

Yield results presented in the accompanying tables continue to show a substantial and consistent yield advantage to Paradox Hybrid rooted trees compared to trees on NC Black rootstock. This holds true for both varieties and under both soil conditions. Also notable is the consistency of this Paradox advantage over seven consecutive years of yield date collection (1989 - 1995).

However, yield comparisons between Chandler and Howard diverged from past trends this year. Chandler (5214 lbs/Ac.) outyielded Howard (4485 lbs./Ac.) in this mechanically pruned hedgerow. This is of particular interest in light of the observation that the Howard variety generally responds (yields) better to yearly alternate side mechanical hedging than the Chandler variety.

Also contrary to the results in prior years, is the higher production from trees on non-slip plow soil versus slip plow modified soil. It should be noted that soil conditions vary significantly
within the trial area. About fifty percent of the test area consists of Arbuckle sandy loam to a depth of 4 - 5 feet. The Hillgate series covers the remainder exhibiting a similar sandy loam texture but only to a depth of two feet where a dense clay layer limits deeper rooting. Past data has shown no yield difference between the two soil treatments. Given the use of high frequency (2-4 times per week) low volume irrigation and monthly fertilization, mixing soil layers may not benefit yield at this stage in tree development.

Surprisingly, this test plot continues to produce respectable walnut yields of desirable quality despite adverse soil conditions but more time will be required to fully evaluate this walnut production strategy in terms of economics. Horticulturally, the eighteen foot row width is too close and impractical for commercial use. Under these soil conditions, Howard needs at least twenty feet between rows while Chandler would seem to require at least twenty-two feet.

**1995 Walnut Yields**

**LBS/AC**

*Howard Variety*

<table>
<thead>
<tr>
<th>Unmodified Soil</th>
<th>NC Black</th>
<th>Paradox</th>
<th>LSD @ 1%</th>
<th>1732 lbs.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>3627 B</td>
<td>5430 A</td>
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</table>

*Slip Plow*

<table>
<thead>
<tr>
<th>NC Black</th>
<th>Paradox</th>
<th>LSD @ 5%</th>
<th>1332 lbs.</th>
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<tbody>
<tr>
<td>3734 B</td>
<td>5149 A</td>
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*Chandler Variety*

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<th>Paradox</th>
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<tr>
<td></td>
<td>4939 B</td>
<td>6837 A</td>
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*Slip Plow*

<table>
<thead>
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<td>5649 A</td>
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</table>

*Average Yields For All*

- Paradox Plots 5766 A
- NC Black Plots 3933 B
  LSD @ 1% 611 lbs.
- Chandler Plots 5214 A
- Howard Plots 4485 B
  LSD @ 5% 563 lbs.
- Unmodified Plots 5208
- Slip Plowed Plots 4491
Yearly & Accumulative Yields

lbs./Ac.

<table>
<thead>
<tr>
<th>Variety</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>9th</th>
<th>10th</th>
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<tbody>
<tr>
<td>Howard Hyb.</td>
<td>404</td>
<td>1085</td>
<td>2343</td>
<td>4308</td>
<td>5476</td>
<td>5680</td>
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<td>571</td>
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<td>4883</td>
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<td>Howard BK</td>
<td>387</td>
<td>976</td>
<td>1901</td>
<td>3051</td>
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<td>3961</td>
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<td>757</td>
<td>1901</td>
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