Walnut Trees in the Nursery Trade:
Understanding Terminology, Propagation,
Availability and Clonal Rootstock Pest Interactions

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Helpful Terminology in Understanding Walnut Plant Material

Cultivar (cultivated variety) - A named group of plants within a cultivated species that is distinguished by a group of characteristics, e.g. ‘Chandler’, ‘Howard’

Genotype - The genetic constitution of an individual.

Clone - A group of plants (scion or rootstock) reproduced from a single individual by vegetative methods (grafting, cuttings, layering, micropropagation). Plants produced in this manner all have the same genotype as the parent. However, variation can exist among individuals of a given clone resulting from their interaction with the environment.

Micropropagation - Multiplication of plants under sterile in vitro conditions in a lab followed by hardening off in a greenhouse. (Most of the clonal rootstock and own-rooted walnut plant material in the trade is micropropagated.)

Grafted plant - A plant whose roots are of one genotype and the shoots (scion) are of a different genotype. It is obtained by grafting or budding a cultivar onto a rootstock.

Own-rooted (also known as self-rooted) plant - A plant whose roots are of the same genotype as the shoots. It is obtained by micropropagation or rooting stem cuttings.

Seedling - A plant propagated from seed.

Plantlet – A plant propagated by vegetative methods, e.g. micropropagation.

Liner – A young rooted plant used for transplanting into a nursery row.

Walnuts are purchased as:

- Rootstock - A seedling or clonally produced tree, to be subsequently field-grafted or budded to the desired English variety (cultivar). Until recently, most rootstocks have been seedlings: Seedling black, seedling Paradox (black x English hybrid), seedling English (no longer available). Clonal Paradox rootstocks with selected characteristics are available from many nurseries.

- Grafted tree – A two-year-old tree with the English variety (scion) grafted onto the rootstock in the nursery after the first growing season.

- Patch-budded tree – A one- or two-year-old tree with the English variety patch-budded onto the rootstock in the nursery in the fall of the first year or during the second growing season.

- June-budded tree – A one-year-old tree with the English variety budded onto the rootstock at the nursery in the spring or early summer.

Own-rooted (also known as self-rooted) tree – An English variety rooted and grown on its own roots until ready for orchard planting. There is no graft or bud union.
Availability in Nursery Trade

**Rootstocks** (sold as ungrafted trees): Seedling Paradox, seedling black, or clonal Paradox ‘Vlach’, ‘VX211’, or ‘RX1’ (and possibly other clonal rootstocks).

**Nursery Grafted or Budded Trees:** Various English varieties on seedling Paradox, seedling black, or clonal Paradox ‘Vlach’, ‘VX211’, or ‘RX1’ (and possibly other clonal rootstocks).

**Own-Rooted English Trees:** Not available in 2012.

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**Characteristics of available clonal Paradox walnut rootstocks based on available data**

<table>
<thead>
<tr>
<th>Trait of Interest</th>
<th>‘Vlach’</th>
<th>‘VX211’</th>
<th>‘RX1’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rootstock Vigor</td>
<td>Vigorous</td>
<td>Highly vigorous</td>
<td>Moderately vigorous</td>
</tr>
<tr>
<td>Resistance to <em>Phytophthora citricola</em></td>
<td>LR²</td>
<td>MR²</td>
<td>MR</td>
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<tr>
<td>(a cause of crown and root rot)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance to <em>Phytophthora cinnamomi</em></td>
<td>LR</td>
<td>LR</td>
<td>MR</td>
</tr>
<tr>
<td>(a cause of root and crown rot)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance to <em>Agrobacterium tumefaciens</em></td>
<td>LR - MR</td>
<td>LR</td>
<td>LR - MR</td>
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<tr>
<td>(cause of crown gall)</td>
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<td></td>
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<tr>
<td>Root Knot Nematode</td>
<td>S³-IT⁴</td>
<td>S-ST⁴</td>
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<tr>
<td>(Pratylenchus vulnus)</td>
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<td></td>
</tr>
<tr>
<td>Root Lesion Nematode</td>
<td>HS³-IT</td>
<td>S-ST⁵</td>
<td>HS-IT</td>
</tr>
</tbody>
</table>

¹Based on data from ongoing UC and USDA-ARS trials
²LR = low resistance; MR = moderate resistance
³Nematode’s ability to reproduce: HS = highly susceptible; S = susceptible
⁴Tree response to nematode: ST = some tree tolerance to nematode presence; IT = tree intolerant to nematode presence, i.e. reduced tree vigor/health in presence of nematode
⁵Tolerate due to a post-infection resistance mechanism

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