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Nota/Note

Comparison of Pixie mandarin growth on five different rootstocks

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SUMMARY

Pixie mandarin is a very vigorous, upright tree. The rootstock standards for this small industry are Swingle citrumelo and C-35 citrange, which encourage tree vigor. A 2014 planting of Pixie has been evaluating the size reducing effects of the relatively new rootstocks Bitters citrange, Carpenter citrange and Furr citrange (all three of which are also *X. Citroncirus* spp.). After two years, Pixie on Swingle citrumelo is the largest tree. Of the new rootstocks, Furr is the largest and Bitters the smallest. The trial was replicated at two sites with two different pH soils. At one site with the highest soil pH, Bitters showed iron chlorosis.

Index terms: Carpenter, Bitters, Furr, Swingle citrumelo, C-35.

Comparação do crescimento da tangerina Pixie em cinco porta-enxertos diferentes

RESUMO

A tangerina Pixie apresenta uma planta muito vigorosa e ereta. Os principais porta-enxertos para esta variedade são Swingle citrumelo e C-35 citrange, que proporcionam alto vigor às árvores. Um ensaio implantado em 2014, com tangerina Pixie, tem avaliado os efeitos da redução de tamanho das copas, com uso de novos porta-enxertos: Bitters citrange, Carpenter citrange e Furr citrange (todos os três também são X. Citroncirus spp.). Após dois anos, Pixie enxertada em Swingle citrumelo são as maiores plantas. Dos novos porta-enxertos, Furr é o mais vigoroso e Bitters o menor. O ensaio foi repetido em outros dois locais com dois solos de pH diferentes. Num local com o pH do solo mais alto, as plantas enxertadas em Bitters citrange, apresentaram clorose de ferro.

Termos de indexação: Carpenter, Bitters, Furr, Swingle citrumelo, C-35.

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INTRODUCTION

Pixie mandarin *Citrus reticulata* Blanco is a very vigorous, upright tree. Although the fruit is small, hence its name, it can produce fruit on the ends of long branches which deforms the canopy structure, making it hard to pick. The rootstock standards for this small industry are Swingle citrumelo and C-35 citrange (both of which are *X. Citroncirus* spp.). The industry is looking for alternatives to these choices, especially those that reduce the vigor of the trees.

There is no one ideal rootstock at this point and growers have the option of a wide range of choices. The search includes those that are resistant to Citrus Tristeza Virus (CTV), *Phytophthora*, calcareous soils and ideally one that is resistant to the bacteria that causes Huanglongbing.

In many California coastal growing areas, land is expensive, water scarce and costly and prone to calcareous soils that are derived from marine sediments which can bring on iron chlorosis. Growers are also looking for smaller trees that will give early economic returns, are easier to prune and pick, and may be more compatible with the economics driven by Huanglongbing.

Swingle citrumelo citrange yields a large tree with good quality and quantity of fruit. It is tolerant of CTV (Citrus tristeza virus) and *Phytophthora* spp, but is susceptible to iron chlorosis in high pH soils. C-35 citrange is a smaller tree than Swingle citrumelo, also has resistance to *Phytophthora spp* and CTV, and is more tolerant of high pH soils (Bitters, 1986).

The USDA had a breeding program in California which was taken over by the University of California. Out of this breeding project, the university selected three rootstocks (all of which are *X. Citroncirus* spp.) for release in 2009 because of their horticultural characteristics, such as dwarfing, although not as much as Flying Dragon trifoliate, resistance to CTV and tolerance of calcareous soils. These three rootstocks also show good tolerance to *Phytophthora parasitica* and nematodes. A fuller description of these selections can be found in Siebert et al. (2010).

Pixie growers have been looking for a more compact tree, easier to handle and not need so much pruning. They funded a long-term project to see how these newer selections of rootstock performed in their area which is a hot summer/cool winter, Mediterranean valley near Los Angeles (34.4480° N, 119.2429° W).

MATERIAL AND METHODS

Ten each of Pixie on one of the five rootstocks were propagated in early spring of 2013. These rootstocks were Bitters (previously C22), Carpenter (C54), Furr-(C57), C35 and Swingle citrumelo. These were planted in spring 2014 at two sites with slightly different soils on spacings of three by three meters. One was more sandy with a soil pH of 7.3 and used herbicides for weed control and other conventional practices, the other had a higher pH of 7.8, used mulch and mechanical weed control along with organic control measures. Five of each rootstock/ Pixie combination were planted in a randomized complete block design. Both sites were microsprinkler irrigated. The plantings are about 10 km from each other. Trees were measured once a year for total shoot length and tree height.

RESULTS AND DISCUSSION

This trial is still young. The newer rootstocks have a bunchier canopy with lots of small branches. Swingle citrumelo at both sites is the largest tree regardless if size is measured by height or branch length (Figures 1-4). At the site with the highest pH, Carpenter is the smallest of the trees (Figures 1, 2). At this site, the other varieties tend to cluster together regardless of how they are measured. At the other site, if measured by tree height, Bitters is the smallest (Figure 3) the others clustering, but as branch length Furr is of a similar dimension as Swingle citrumelo (Figure 4).

These differences will probably sort out as the trees age and develop a more complex canopy. Swingle citrumelo was the largest at both sites. Bitters was generally the smallest and both sites and by both methods of measure. The slightly higher pH at the one site induced an iron deficiency in Bitters that was not seen at the other orchard. The relative size difference effect of the three rootstocks agrees with the report of Federici et al. (2009).

Rootstock effect on tree size is often found (Levy et al., 2008). It will be interesting to see how these trees continue to grow in the future – to see how large their canopies get and if one or more of them can help control the vigor of Pixie. The high-density plantings might be crucial in the future when shorter-lived trees with the presents of Huanglongbing will require more frequent planting (Stover et al., 2008).

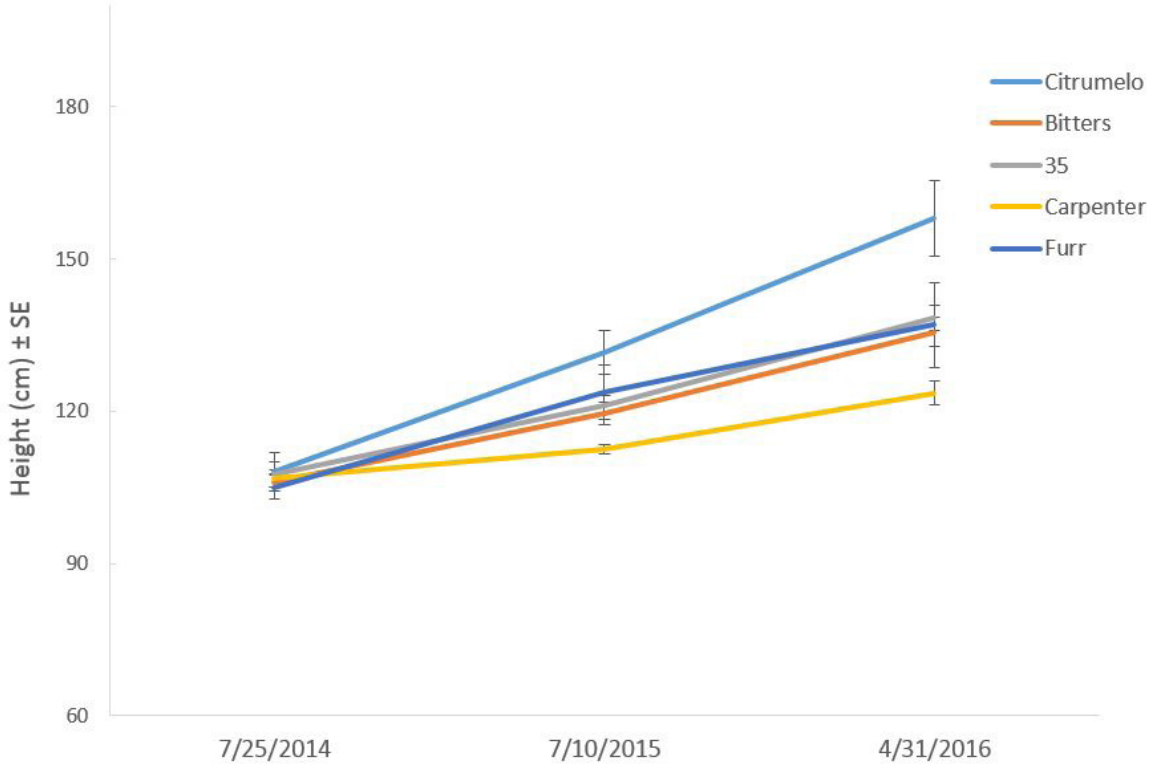

Figure 1. Tree heights at high pH soil site (Churchil Ranch).

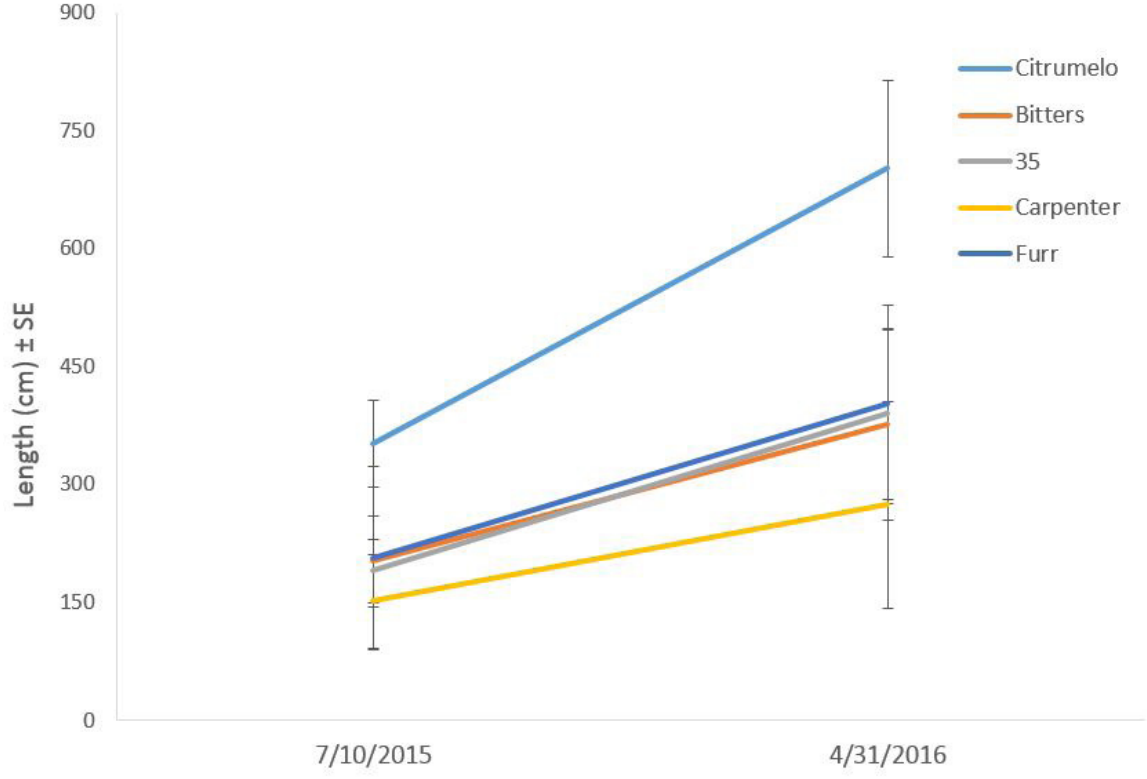

Figure 2. Branch lengths at high pH soil site (Churchill Ranch).

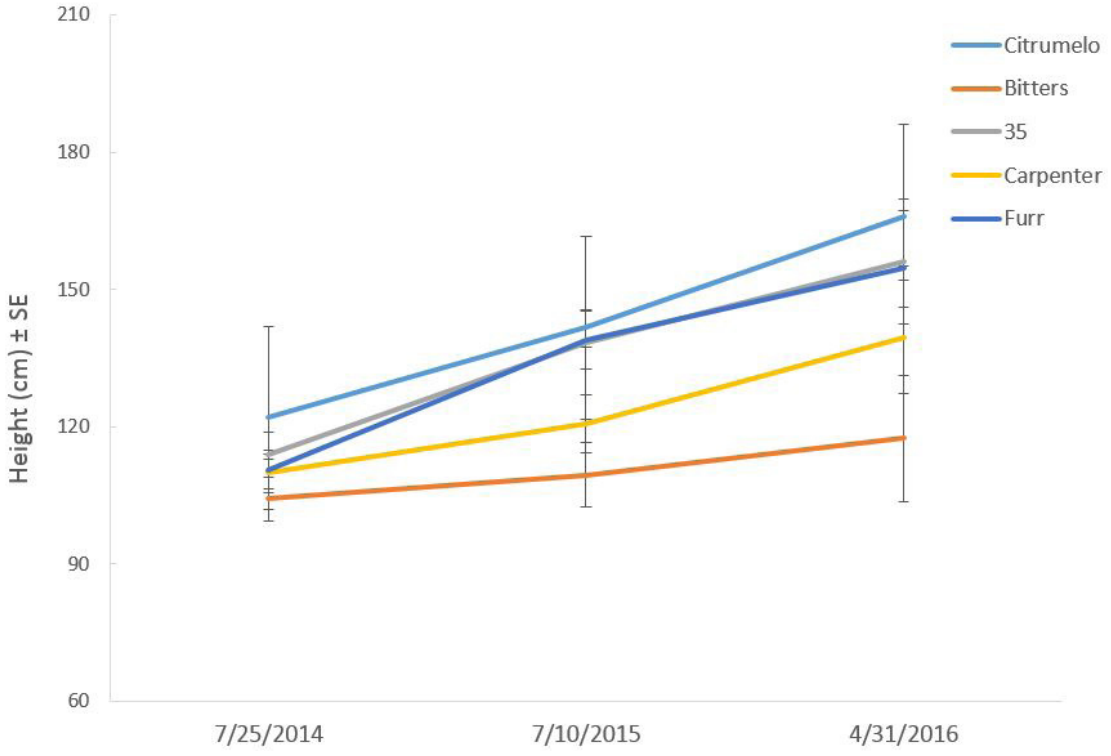

Figure 3. Tree heights at low pH soil site (Friend's Ranch).

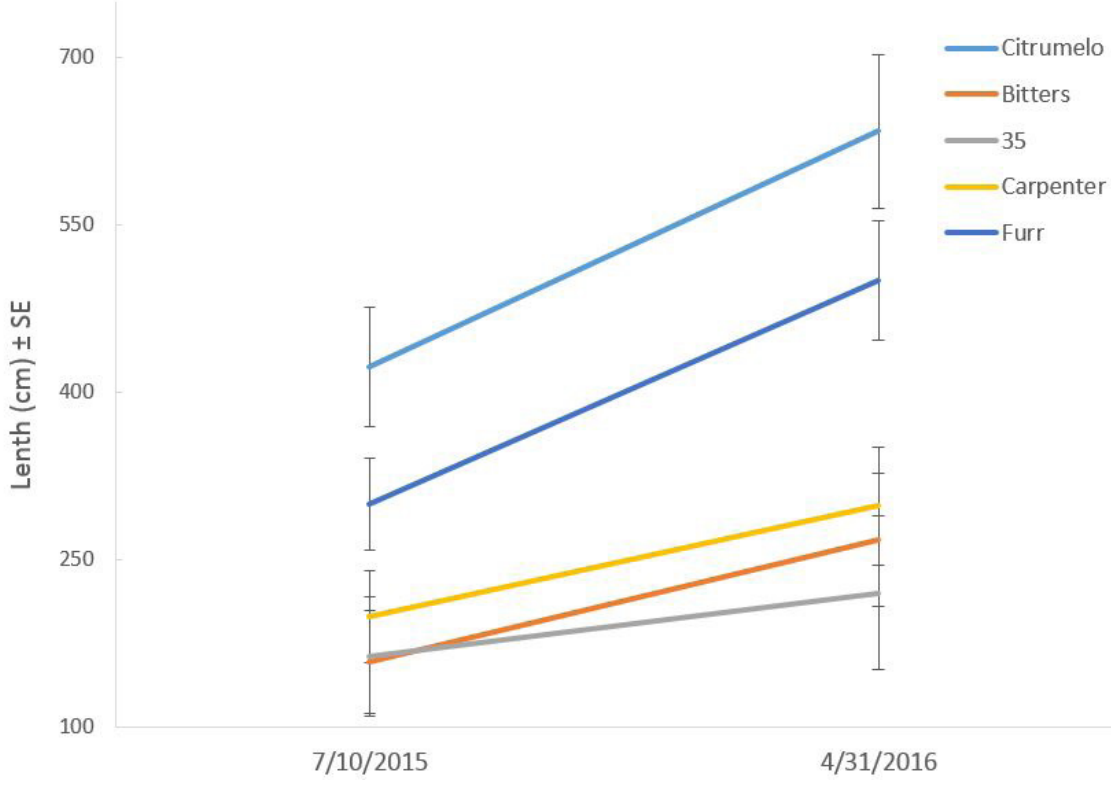

Figure 4. Branch lengths at low pH soil site (Friend's Ranch).

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